

IBAR demos end-to-end capabilities for NCW

TIME-CRITICAL STRIKE MISSION IS SUCCESSFUL



Pilot "flies" F/A-18 from a functional cockpit inside the Virtual Prototype Facility.



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IBAR and Network-Centric Warfare

The Integrated Battlespace Arena (IBAR) is helping the Navy and sister services prepare to wage and win network-centric warfare. The IBAR's nine laboratories and facilities create networked capabilities—rich combinations of virtual and live simulation—that duplicate nearly every aspect of the actual battlespace.

They incorporate not only highly specialized devices, such as the IR scene generator and the Carco five-axis flight simulator, but also a variety of standard Fleet equipment, such as the Tactical Aircraft Mission Planning System (TAMPS) and the Precision Targeting Workstation (PTW). The simulations are designed and run by an experienced team of subject-matter experts.

The Exercise—Taking Out the Scud

A recent exercise at China Lake captured the essence of the IBAR's capabilities. The scenario was plausible, a time-critical strike mission that could happen tomorrow.

The action started out as a planned SLAM-ER attack on an enemy powerplant (for exercise purposes, Coso Plant #1). A strike package was prepared, and the F/A-18 began its flight to the weapon-launch point.

But then the mission changed. Using an electronic intelligence (ELINT) cue, the payload operator at an unmanned aerial vehicle (UAV) ground station spotted a Scud launcher in the target area. Based on the UAV's Scud imagery, a new targeting package was prepared and transmitted into the F/A-18's cockpit.

The pilot quickly reprogrammed the SLAM-ER and moments later launched the missile, which flew to the Scud target and destroyed it. The UAV, still circling overhead, sent images of the target back to the command-and-control center for battle-damage assessment.

The mission used command and control, intelligence assets, the launch platform, the weapon, a targeting group—the same elements that would need to coordinate their actions in a real combat air strike.

Behind the Scenes

The entire end-to-end operation was performed within the IBAR. It began when strike planners at the IBAR's Precision Engagement Center (PEC) received the air task order and planned the strike using mission-planning equipment identical to that in the Fleet today.

A pilot flew the F/A-18 from a functional cockpit in the Virtual Prototype Facility. Every movement of the hands-on-throttle-and-stick was reflected in a dizzying change of the full-color out-the-window display surrounding him on three sides.

Meanwhile, another operator was flying the UAV and operating its observation payload at the UAV work station. By manipulating two small joysticks, he scanned a digitized terrain map of the target area, located the Scud, and fed target information to the PEC.

When the UAV's image of the Scud was received at the PEC's Rapid Targeting Cell, an operator georeferenced the images with a highly accurate terrain database to obtain precise coordinates for the new target.

An actual SLAM seeker, mounted on a flight table in front of an IR scene generator, tracked the simulated target.

Such an exercise calls for a lot of computational horsepower. This was provided by the WD High-Performance Computing (HPC) Center, a DOD HPC Distributed Center which is collocated with the IBAR.



Successful strike—Andy Corzine, shown here with the SLAM-ER seeker in a Carco flight simulator, coordinated the IBAR's end-to-end strike demonstration.

Real-World Tools for High Fidelity

Authenticity is an essential ingredient in IBAR operations. For example, to get the Scud image from the IR scene generator to the pilot's digital display the scene was presented to the SLAM seeker. From the seeker, it was then run to actual AN/AWW-13 data-link hardware—the same data-link pod used in operational F/A-18/SLAM firings—and then the output of the AN/A WW-13 was sent to the pilot's display.

IBAR does not just deal with laboratory simulations. It uses a lot of actual Fleet hardware and software. A sailor sitting down at our TAMPs or PTW consoles would see exactly the same piece of equipment that he or she uses every day planning tactical missions. IBAR is able to mix simulations and operational systems as required.

Why Simulate Anyway?

Integrating the virtual world with the real-world is one of the most valuable aspects of the IBAR. A single component—a missile seeker, for example—can be inserted in a large virtual simulation to see how that component responds and reacts in different simulated scenarios. These scenarios can be run thousands of times, each with a slightly different variation, to optimize system performance.

Not only can hardware and software be tested at the IBAR, concepts and tactics can also be exercised and refined. The cost of IBAR testing is a small fraction of that required to test equipment in live flight testing. Plus, there's an added benefit. Simulation testing helps the engineers plan their live flight tests much more efficiently, so valuable air and range time need not be wasted resolving issues that have already been worked out in the IBAR.

Fitting the pieces together

One of the most valuable aspects of the IBAR for network-centric warfare involves interface issues. By linking many discrete functions (e.g., command and control, reconnaissance, strike, battle damage assessment) into a single working test, as was done in the Scud exercise, problems with communications and system compatibility can be identified and resolved.

VAdm. Arthur Cebrowski, writing in Naval Institute *Proceedings*, noted that "Network-centric warfare derives its power from the strong networking of a well-informed but geographically dispersed force."

To that end, the IBAR itself often functions as a single piece in larger networked simulations. Recent scenarios have linked the IBAR to China Lake's F/A-18 Advanced Weapons Laboratory, Point Mugu's Battle Management Information Center, Patuxent River's Air Combat Environment Test and Evaluation Facility, and (via SIPRNET) the *USS Coronado* operating off the California coast.

Network-centric warfare reflects the most fundamental change in warfare in 200 years, and the IBAR, with its end-to-end capabilities, is a powerful tool for making this new concept work. Success in combat never will be a certainty. But for U.S. military forces, continued development and refinement of network-centric warfare will greatly improve the odds.

